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(71) Applicants
G. Bauknecht Gesellschaft mit Beschränkter Haftung, Heidenklinge 22, D-7000 Stuttgart 1, Germany, Fed. Rep. of Germeny
(72) Inventors
Peter Glasmacher, Gerhard Meier, Hanspeter Langjehr
(74) Agents
Marks & Clerk

(54) Program-indicating device

(57) A domestic appliance H has a program display panel T comprising visual display elements E each corresponding to a particular operating step. When the program is selected using a keyboard or other selector P, the program controller ST activates all the display elements E corresponding to steps in the selected program. As the program runs, the controller ST deactivates the display elements in succession, as the corresponding steps of the program are completed. Consequently the initial display shows what steps form the program, and during operation the display shows what step is currently running and what further steps remain to be performed. The final display element may remain activated when the program ends.

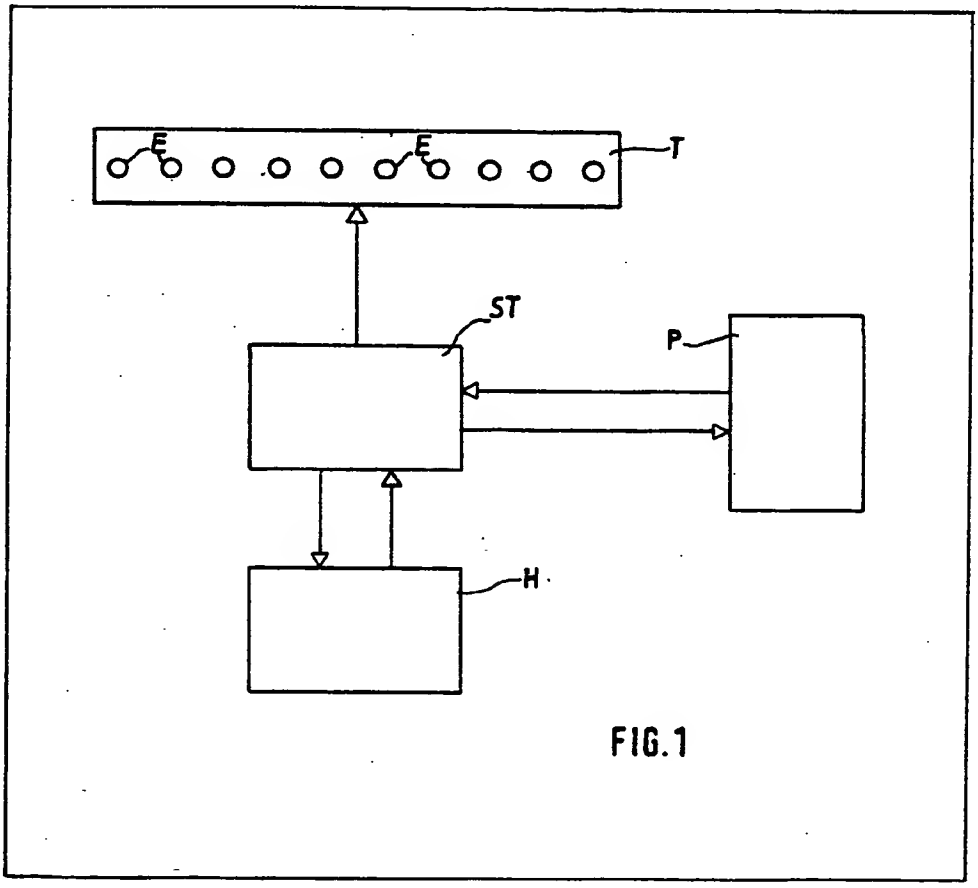

FIG.1

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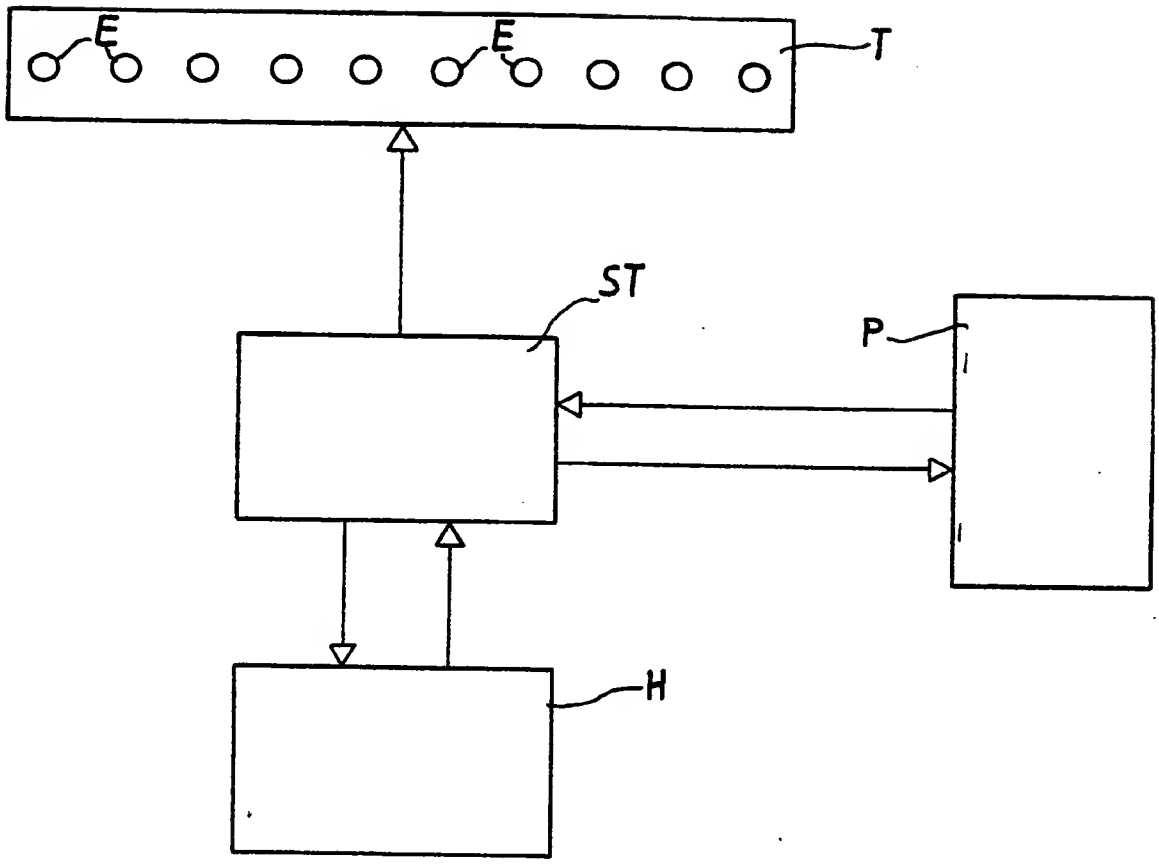

FIG.1

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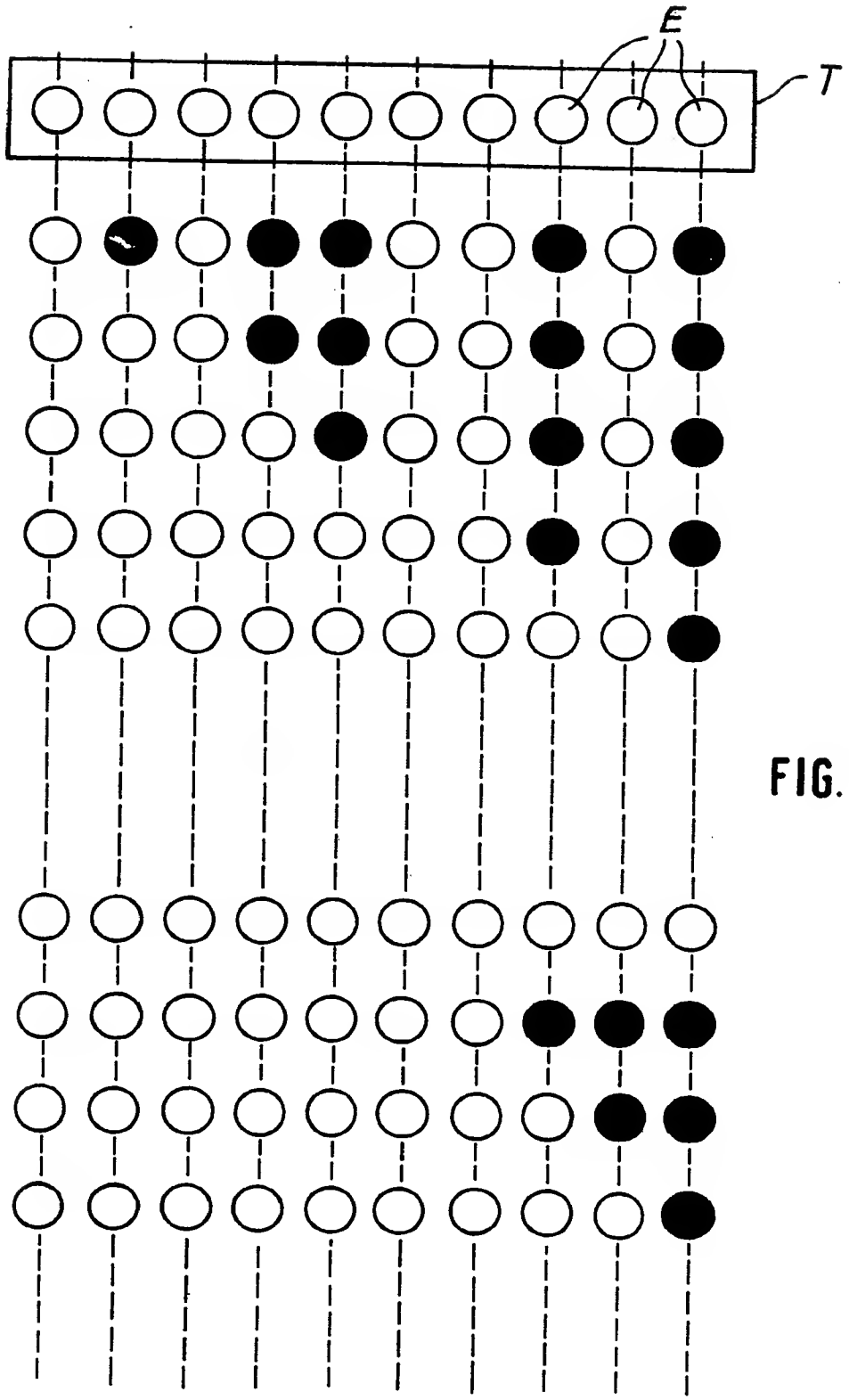

FIG. 2

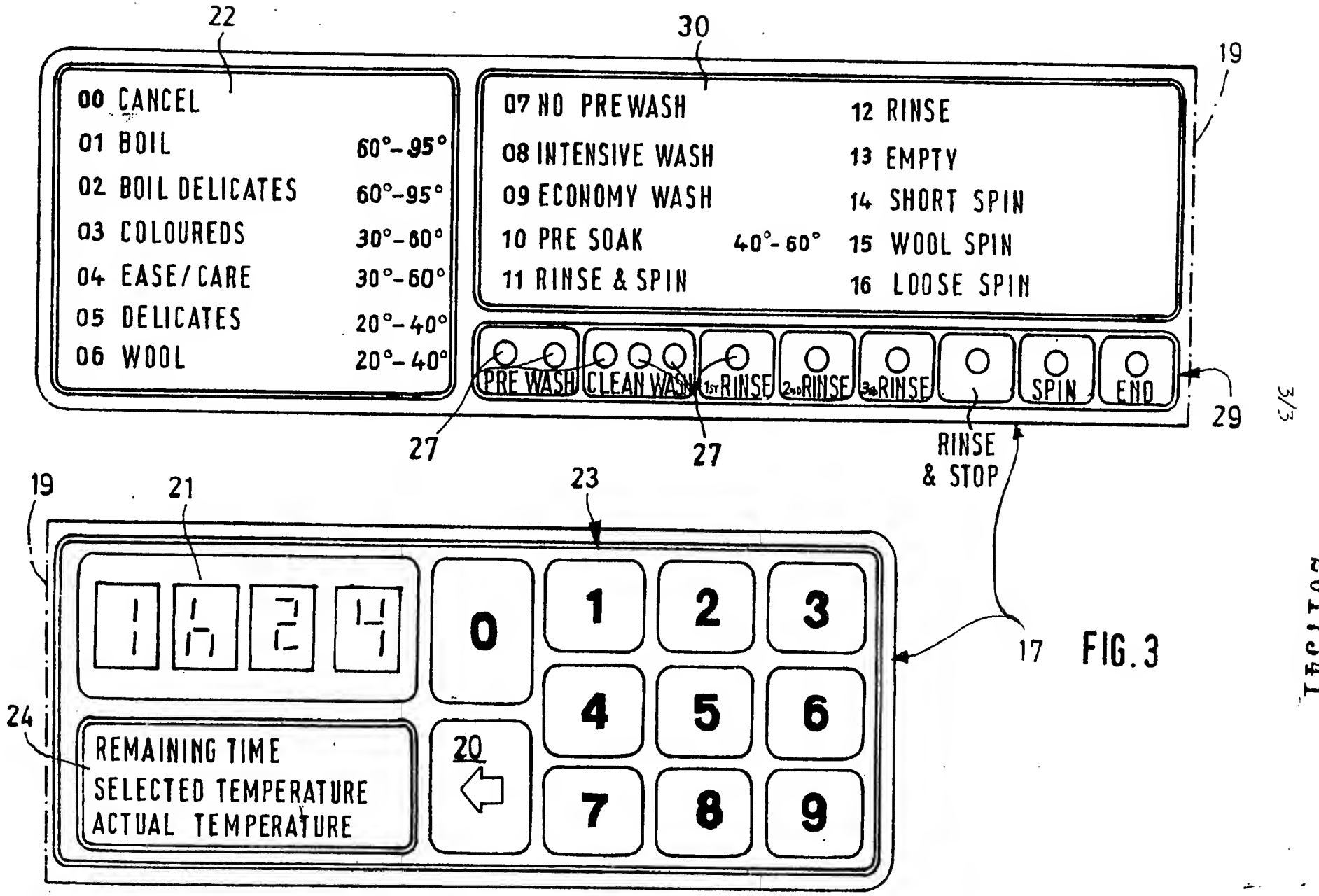

FIG. 3

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SPECIFICATION

Program-indicating device

The invention relates to a program-indicating device for domestic appliances which operate in accordance with a presettable program comprising a sequence of individual program steps. The invention relates more particularly to means for indicating the program routine in the operation of automatic washing machines, tumbler driers, and automatic dish washers of the kind used domestically. Other examples of appliances in which the invention can be used are laundry driers and micro-wave ovens.

Operation of all these appliances is performed in accordance with a selectable program comprising a plurality of individual steps, of which several may be combined into a program block so that the overall program can be composed of a plurality of blocks, each comprising a changing number of individual steps. For example, an automatic washing program as a rule comprises the prewash, the clean wash, three or four rinses, and final spinning. The individual steps of such a program take place in a specific timed sequence, and each of the individual steps can be varied in accordance with the selected program.

Accordingly, the overall program and its individual steps or step blocks can occupy different amounts of time, and it is very useful to render the course of the program routine in the apparatus visible externally so that the user or users of the apparatus can determine the occupation of the apparatus by the program which is being worked through.

Various program state indicators are known. A typical example is described in German Offenlegungsschrift 17 10 785. In this known system, intended for monitoring the operating state of automatic washing machines, a display panel, disposed on the front of the washing machine above a series of operating switches, includes a plurality of display areas, each of which can be individually illuminated and each of which is associated with a specific operation within the washing machine. The said display panel is coupled to the control system for the program routine of the washing machine so that only the particular display area corresponding to the program step being carried out at the time, is illuminated.

The known system is therefore able to provide a visual display of the particular place in the program at which the washing machine is operating. However, especially if the number of possible program steps is large and is not identical for each selectable program, it is of special interest to obtain information as to which steps still remain to be performed by the machine until the preset program is completed.

It is therefore the object of the invention to provide a program indicating system capable of indicating not only the program step currently in operation but also of always providing information as to which complete program steps still have to be performed by te apparatus to reach the end of the selected program.

According to the invention there is provided a program-indicating device for a domestic appliance which operates in accordance with a presettable program comprising a sequence of individual program steps, comprising a display panel having visual display elements corresponding to respective individual program steps, and control circuitry arranged to activate, on selection of a program, the display elements corresponding to the program steps of the selected program and to deactivate the activated display elements in step with the progress of the program.

In the program indicating device constructed in accordance with the invention display elements, for example indicating lamps, neon lamps, light-emmitting diodes or other visual display elements are arranged in one, or more rows side by side and/or one below another on a display panel, for each program step which is possible within a selectable program or only for a selection of the most important of the set program steps, and all the display elements corresponding to an individual step or program block within the selected program are made evident, for example by being illuminated, by means of the program control system together with the program selection. The selection of the program *via* the control system leads directly to a visual display of all steps which have to be completed to perform the set program. Program selection therefore enables the user of the apparatus to see the amount of work involved in the selected program and whether all desired individual steps are in fact contained in the set program. As the program is carried out, all display elements for which the corresponding program step or program block has already been completed, are rendered inoperative, for example by extinguishing the corresponding indicating lamp, as soon as the relevant program step or block is completed. The display elements which are in the active state therefore show not only which individual step of the program is in operation but also which of the program steps or program blocks have still to be operated to complete the selected program. This program indicating system is simple, can be produced at low cost, occupies only a small amount of space, and provides particularly good, neatly grouped information regarding the program content and progress of the program.

The final display element can generally be associated with the program end so that, for example, illumination of the last lamp alone indicates that the apparatus has completed its preset program.

One embodiment of the invention is illustrated in the accompanying drawings in which:

Fig. 1 is a block circuit diagram showing the electrical connection of the display panel of a program indicating device in accordance with the invention, to the control system and other parts of

an appliance;

Figure 2 shows diagrammatically the display panel of Fig. 1 for different operating states in two different programs of the domestic appliance; and

Fig. 3 shows a selector and indicating panel of a domestic washing machine.

The block circuit diagram of Fig. 1 shows an indicating panel T on which a total of ten indicating elements E are arranged side by side in a single row. These indicating elements can be, for example, indicating lamps, light emitting diodes, neon lamps or other visual display devices which can be actuated and more particularly can be illuminated. They can however also take the form of areas provided with lettering or pictorial symbols, in which case they are preferably translucent and illuminable from the rear.

Each of the said indicating elements E is associated with a possible program step or program block for the operation of a domestic washing machine H or other apparatus which is operated by program control, and activation or illumination of such indicating element indicates that the corresponding program step or program block has yet to be completed. Optionally it is possible for the last of the indicating elements E to be associated with the end of the program so that when this element alone remains in the activated state it indicates that the program has been completed.

The indicating elements E on the indicating panel T are electrically connected to the appliance H *via* a control system ST which is preferably a microcomputer or microprocessor also controls operations within the appliance H. The control system ST is also associated with a program input device P by means of which the appropriate program can be selected.

The method of operation of the program indicating system with the indicating panel T and the indicating elements E is shown diagrammatically in Fig. 2 for two different program examples; solid circles show activated indicating elements E, for example, illuminated indicating lamps, while the empty circles show the indicating elements E in the state in which they are not activated or are no longer activated, for example, not illuminated.

The first of the programs shown comprises the program steps or program blocks 2,4,5, 8 and 10. When the program is entered *via* the program entering device P the control system ST will therefore cause the second, the fourth, the fifth, the eighth and the tenth of the indicating elements E to be activated, for example to be illuminated. The tenth indicating element E can be associated with the end of the program instead of or as well as being associated with an actual program step or program block.

In the course of operation of the appliance the program steps or program blocks of the selected program are successively performed, and whenever a program step or program block is completed the control device ST will change the associated indicating element E on the indicating panel T into the inactive state, for example it will cause the corresponding indicating lamp to be extinguished.

Of the five lines associated with the first program example in Fig. 2, the first line therefore indicates the initial state immediately after the program has been entered or while the first program step or program block is in the course of operation, the second line indicates the state after completion of the program step or program block 2, the third and fourth line indicate respectively the state after completion of the program step or program block 4 and 5, and the fifth line indicates the state after completion of the program step or program block 8, which can also signify the end of the program.

The second program in Fig. 2 comprises the program steps or program blocks 8,9 and 10, so that activation of the eighth, ninth and tenth indicating elements E corresponds to the initial state, as shown in the first program line. The succeeding lines indicate the progress of the program by the states of the respective indicating elements E.

An example of a complete selector and indicating panel 17 of a domestic washing machine is shown in two lines in Fig. 3, although on the washing machine itself the panel will be disposed in a single line with the bottom part of Fig. 3 attached at the chain line 19 to the chain line 19 of the top part of Fig. 3. The rest of the washing machine is not shown but it should be noted that the machine is controlled by a microprocessor.

Six optionally selectable programs "01" to "06" are shown in the area 22 of the selector and control panel 17 and these programs can be selected by means of keys (0 to 9) which respond to finger touch and are arranged as a keyboard 23. The required key selection appears on the left, of the area 22, adjacent to each program and is shown in words, for example the keys "0" and "1" must be actuated successively if the "boiling" program is selected. The temperature ranges appearing adjacent to the programs indicate that within these ranges the temperature of the washing liquid can be freely selected in steps of 1 °C. When a program is selected the highest temperature of the program will appear in the digital display area 21, i.e. the temperature "95°C" for the "boiling" program, and the displayed temperature is that set for the clean washing phase of the program. At the same time the inscription "selected temperature" will be illuminated in the area 24. If the displayed temperature is thought to be too high by the housewife, she can select another temperature within the stated temperature range, for example any desired temperature between 60° and 95°C for the "01" program, by using the keyboard 23. To select a temperature, for example, of 65°C, the keys "6" and "5" must be successively touched whereupon the selected temperature of 65° will be shown in the area 21. If the temperature keyed in, is outside the permitted range for the selected

program, it will not be programmed, and an audible signal will sound or a visual signal will appear and the last set temperature will remain set.

The program steps of the selected program are indicated by illumination of the parts (as 27) of the indicating panel 29. For example, in the "01" program all dots of the indicating panel 29 inscribed with the program steps will be illuminated with the exception of the individual area dot "rinse stop". As each program is completed the dots 27 of the individual areas are extingushed in accordance with the progress of the program routine so that the housewife is able to monitor the progress of the program by observing the indicating panel 29. The two dots 27 in the individual area for the prewash can indicate the subdivision of the prewash operation into two program steps, of which the first dot is extinguished when the water filling operation is completed or the liquid has been heated and the second is extinguished when this program step is completed. The "clean wash" step has three dots 27 which indicate the progress of the main washing operation by dividing it into three program steps associated with the three corresponding dots 27 which can have the following meaning: Fresh water intake including heating of the washing liquor; washing; cooling of the liquor and discharging thereof. The "rinse stop" display indicates that the program routine will be completed after the last rinsing operation without the rinsing water being discharged, so that the laundry continues to float in the rinsing water until the housewife selects the "empty" program step by keying in "13" with the keyboard 23 whereupon the rinsing liquid is pumped off and thereafter the housewife is able to remove the laundry.

The area 30 contains special program steps and special program changes which can also be selected with the keyboard 23. For example, by selecting "07" a program which was originally programmed with prewash can be shortened by eliminating the prewash. If "08" is selected it means an intensive wash will be performed, corresponding to lengthening of the clean-washing time. When "economy" is selected the program will proceed by economy operation, i.e. a reduced amount of liquid is used for washing and where appropriate also for rinsing. In all other respects all program steps can be operated without modification; however, the time for heating the washing liquid is shortened due to the reduced amount of washing liquid.

"Presoak" relates to an additional main program step which is performed prior to the beginning of the selected program and by means of which the laundry is soaked and which step can be indicated by an illuminated dot, not shown, but arranged to precede the illuminated dots 27 for "prewash". The temperature for pre-soaking can be freely selected in the range 40° — 60°C. The programs "rinsing plus spinning" and "rinsing" can be additionally entered or on completion of the normal program additional rinsing and/or spinning can be obtained by selecting these programs, or laundry, washed by hand outside the washing machine, can be merely rinsed and/or spun by use of these programs. If short spin, wool spinning or loose spinning had already been selected with the program selection, only the short spin or the gentle wool spin or a special loose spin will be performed in place of normal spinning (if this program step was provided).

CLAIMS

1. A program-indicating device for a domestic appliance which operates in accordance with a presettable program comprising a sequence of individual program steps, comprising a display panel having visual display elements corresponding to respective individual program steps, and control circuitry arranged to activate, on selection of a program, the display elements corresponding to the program steps of the selected program and to deactivate the activated display elements in step with the progress of the program.

2. A device according to claim 1, in which the control means which controls the running of the program is coupled to the display panel so that all display elements corresponding to the individual steps of the selected program are activated when the program is entered and each element remains activated until the corresponding program step is completed.

3. A device according to claim 1 or 2, in which that the last display element on the display panel corresponds to the end of the program.

4. A device according to claim 1, 2 or 3, characterised in that the display elements comprise light emitting diodes and/or neon lamps which are illuminated as soon as the corresponding program step is entered and are extinguished only when the corresponding program step is completed.

5. A device according to claim 1, 2or 3 characterised in that the display elements comprise translucent areas which can be illuminated from the rear and are provided with visual information appropriate to the corresponding program step.

6. A device according to claim 1, 2, 3, or 4 characterised in that the display elements are illuminated dots which are situated adjacent to a description of the corresponding program step.

7. A program-indicating device for a domestic appliance, sustantially as herein described with reference to the accompanying drawings.

8. A programmable domestic appliance incorporating a program-indicating device as claimed in any of the preceding claims.

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